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C5G GEX G701 G702 G703 G704 G707 G709 G710
G711 G712 G802

(56) Documents Cited

GB 2267289 A GB 1090704 A GB 0395282 A
US 4981496 A

WPI Accession No. 77-08704Y/05 & JP770000961B

WPI Accession No. 74-60725V/34 & JP740028244B

WPI Accession No. 78-55783A/31 & JP790044282B

WPI Accession No. 94-284330/35 & RU2009181C1 WPI

Accession No. 93-279982/35 & SU1759857A1 WPI

Accession No. 88-346332/49 & CN880103948A WPI

Accession No. 83-836075/49 & JP580185689A WPI

Accession No. 91-228362/31 & KR900004941B

(58) Field of Search

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INT CL⁶ C10L 5/02 5/36 5/38 9/10 9/12

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(54) Briquettes containing an oxidiser

(57) Briquettes, particularly based on carbonaceous matter, contain an oxidising material e.g. inorganic nitrate, nitrite, chlorate, perchlorate, permanganate etc. or nitrocellulose. The briquette may also be treated with an oxidising acid such as nitric acid to form the oxidising material. The briquettes may be layered or shaped with an igniting layer containing the oxidiser and may have flues running therethrough. Utility may be domestic or industrial.

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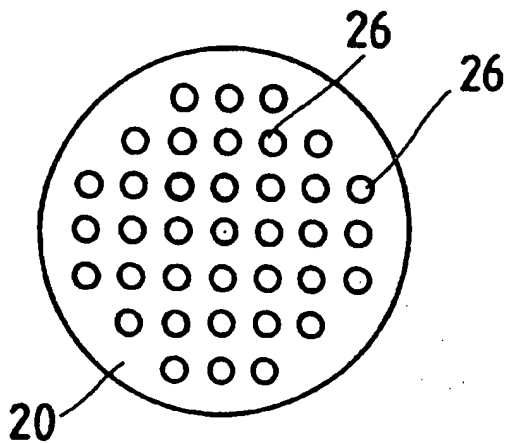


FIG. 3

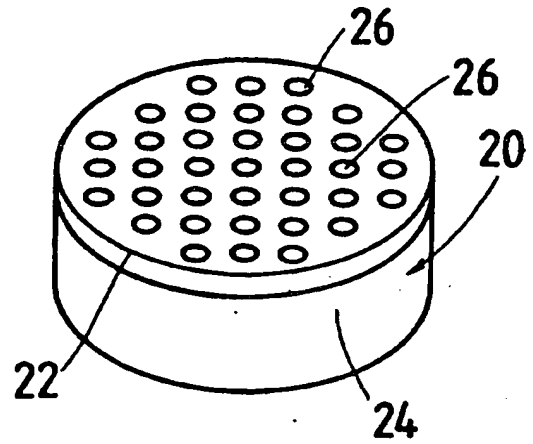


FIG. 4

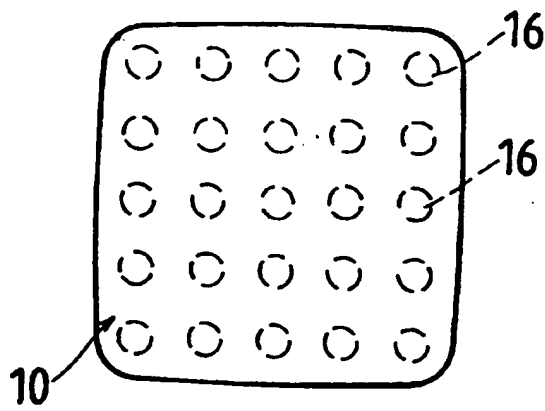


FIG. 1

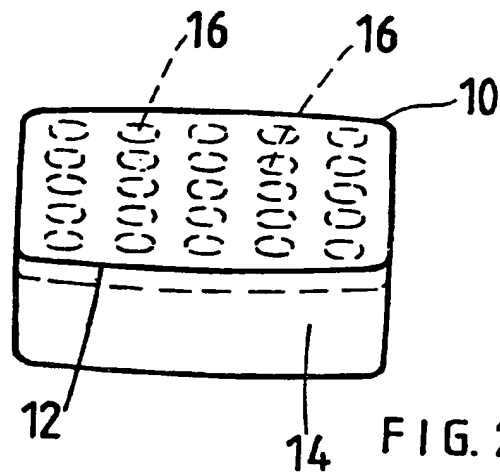


FIG. 2

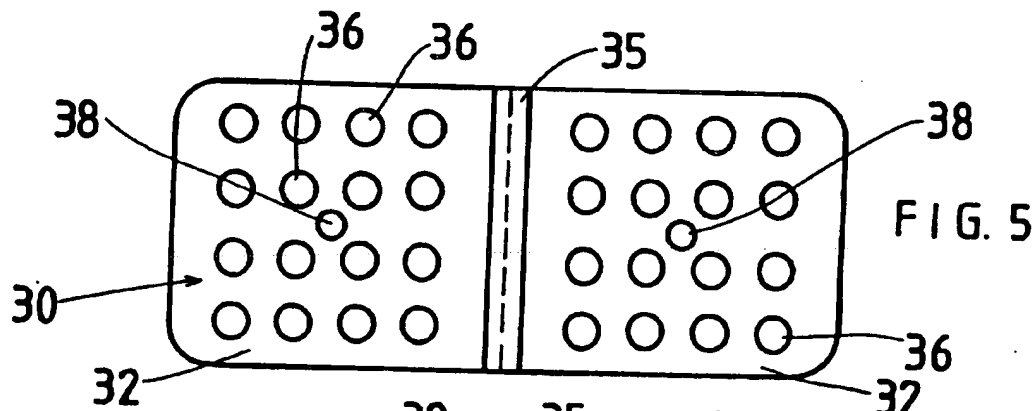


FIG. 5

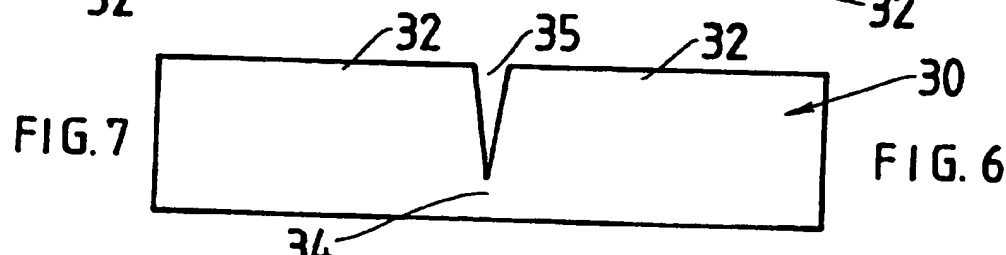


FIG. 7

FIG. 6

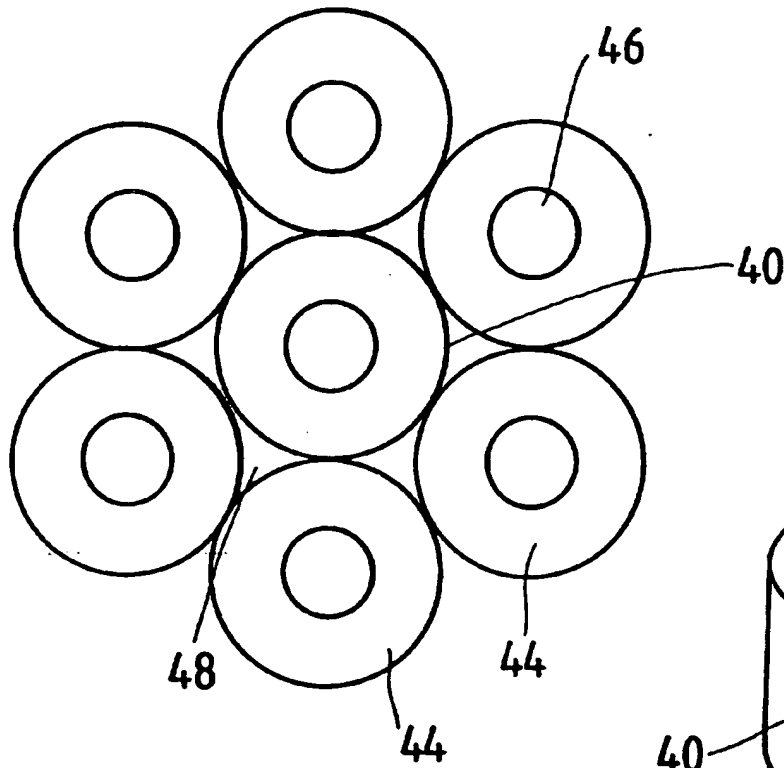


FIG. 8

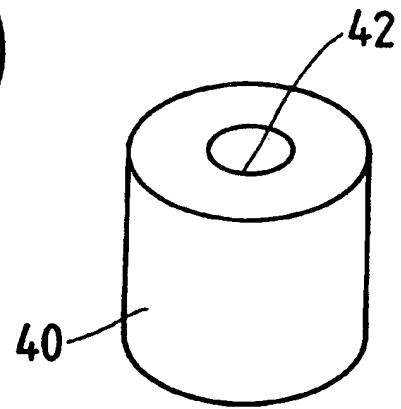


FIG. 7

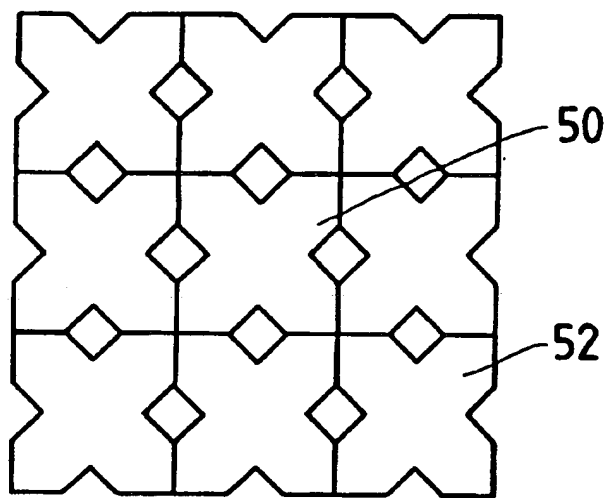


FIG. 10

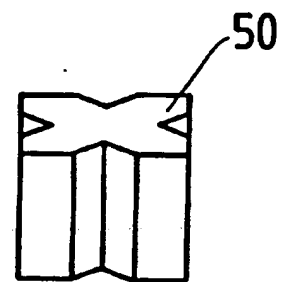


FIG. 9

IGNITER BRIQUETTES

This invention relates to carbonaceous combustible material.

The invention is concerned with a combustible unit comprising combustible carbonaceous material which is hereinafter called "a briquette". The term "carbonaceous material" is a common name for materials such as coal, coke, lignite, charcoal or peat. It is also intended herein to include cellulosic materials such as fibre, saw dust, bagasse or any plant refuse material, pulp, paper, and sewage with a dominant cellulosic component. Such a briquette is usually formed from a fine form of the abovementioned materials where particle size can vary from one micron to two millimetres in diameter. The active materials of the briquette are linked together by a binder (except in cases where they are binders themselves), which may be a water based binder such as starch, lime with molasses, ligno-sulphanates, silicates, cement or lime, inorganic salts and others. The binder can also be a non-water binder such as bitumen. Although the present process tends to prefer a wet forming method it can apply to non-wet forming methods as well. The loose materials are consolidated in a mould by pressure, temperature, vibrations or any combination of the above so as to make solid units of constant size. The briquettes may constitute industrial/domestic fuels such as coal and coke briquettes as well as charcoal briquettes used for

making a barbecue or "br ai" and sold for the domestic market.

According to one aspect of the invention there is provided a briquette incorporating oxidizing material.

5 The briquette may preferably comprise two sections that are attached to one another, one of the sections (hereinafter called "the igniting section") being high in oxidizing material. The other section (hereinafter called "the combustible section"), which could be with-
10 out oxidizing material, but can incorporate oxidizing material of lower content. The combustible section will normally be of larger volume than the igniting section. Conveniently the igniting section may comprise between fifteen and thirty per cent by mass, and preferably
15 twenty per cent of the briquette.

 The oxidizing material (which is also called "the oxidizer"), or if there are more than one oxidizer, the oxidizers, may comprise from five to seventy per cent by mass of igniting section of the briquette, conveni-
20 ently from sixteen to forty per cent and preferably between twenty three and thirty five per cent of the mass of the ignitign section of the briquette. At this juncture it is pointed out that all percentages or ratios stated herein are mass/mass unless the contrary
25 is specifically indicated.

The briquette may conveniently be of constant cross-section throughout its height. The igniting section preferably comprises a layer extending across the briquette. This layer is conveniently an end, 5 preferably the top end, layer of the briquette. However the igniting layer may be situated at the bottom or in the middle of the bottom portion of the briquette or at any other position. The important thing is that the igniting section must be sufficient to cause a 10 quick start of combustion of the main part of the combustible section.

Preferably the briquette is provided with one or more internal flues running through it. The height of the flues is preferably between 25 mm and 130 mm. The 15 ratio of the volume of the flues to the solid material of the briquette may constitute between 1:1 to 1:13 and conveniently between about 1:2 to 1:10 and preferably between 1:2,5 and 1:7. The flues are conveniently circular in section and a convenient number is sixteen 20 or seventeen flues or more. To this end the briquette may be approximately square in cross-section or it may be circular in section. Where the briquette has a single flue, the briquette may be annular in section.

In another arrangement, the briquette may be 25 shaped so that when it and similarly shaped briquettes are placed close together they form a combustible unit

comprising solid material with flues therebetween. Thus
conveniently the briquettes may be of circular or annu-
lar section and when placed close to one another there
will be flues therebetween. Alternatively the briquet-
5 tes could be "X"-shaped in section and when placed
close together there will be flues between them. As an
alternative a single briquette of the invention may be
placed, preferably centrally, among a number of simi-
larly shaped briquettes (not including an oxidizing
10 material) to serve as an igniter therefor.

The flues use natural "chimney"-like forces to
create upward air movement that allows for much greater
ventilation. This in turn gives better access to oxy-
gen which accelerates combustion and makes it complete.
15 Again the ratios of different flue volume to solid
volume can provide different types of briquette
according to their intended usage.

The oxidizing material may comprise inorganic
nitrates, particularly inorganic nitrates of metals,
20 nitrites, chlorates, perchlorates, permanganates,
manganates, perbromates, chromates, dichromates and
peroxides as well as any organic oxidizer, for example
nitrocellulose. The oxidizing material may be created
by the action of chemicals on the solid fuel composi-
25 tion. As an example, nitric acid may be reacted with
alkaline ash which is a permanent ingredient of coal or

charcoal to create the appropriate nitrates which serve as the oxidizing materials. Yet again the oxidizer may be formed by the addition of another alkaline component, such as caustic soda or soda ash, to the forming mixture.

The briquettes may be of different sizes, shapes and material compositions according to their intended usage. For example, a bigger, longer burning and mainly charcoal briquette will be produced for making of a barbecue or "braai" for a party where a lot of meat is to be grilled and time is not a critical factor. On the other hand for quick cooking of, say, one litre of water, a smaller and faster burning coal briquette is required. The briquettes can be produced in many sizes appropriate to different kinds of cooking needs. Conveniently however the briquettes may have a mass of from fifty grams to two kilograms.

Embodiments of the invention will be described with reference to the accompanying drawings. Thereafter examples of the constituents of the briquettes of the invention will be described.

In the drawings:-

Figure 1 is a plan of a substantially square briquette of the invention,

Figure 2 is a perspective view from above and one side of the briquette,

Figure 3 is a plan of a circular briquette of the invention,

5 Figure 4 is a perspective view from above and one side of the briquette of Figure 3,

Figure 5 is a plan of a double briquette of the invention,

Figure 6 is a side view of the double briquette,

10 Figure 7 is a perspective view of an annular briquette of the invention,

Figure 8 is a plan showing an arrangement of annular briquettes,

Figure 9 is a perspective view of an "X"-shaped briquette of the invention, and

15 Figure 10 is a plan showing an arrangement of "X"-shaped briquettes.

The composition of the briquettes which will be described below will be as per the examples set out
20 below.

Referring now to Figures 1 and 2, there is shown a briquette 10 which is generally square in plan and of constant cross-section. The briquette 10 comprises an igniter layer 12 located above and secured to a combustible layer 14. Twenty five identical flues 16 are
25 provided running through the entire height of the

briquette. The flues 16 are arranged in five columns and five rows.

Reference is now made to Figures 3 and 4 wherein is shown a briquette 20 of constant circular cross-section. The briquette 20 comprises an igniter layer 22 located above and secured to a combustible layer 24. Thirty seven identical flues 26 are provided running through the entire height of the briquette. The flues 26 are arranged in seven columns and seven rows.

Reference is now made to Figures 5 and 6 wherein is shown a double briquette 30. The double briquette 30 comprises two substantially identical single briquettes 32 joined at a throat 34 formed at a sharp "V"-shaped groove 35. The briquette comprises an igniter layer located above and secured to a combustible layer (neither layer is shown). Sixteen identical flues 36 are provided running through the entire height of each briquette 32 and being arranged in four columns and four rows. A seventeenth flue 38 of slightly smaller diameter is provided in the centre of the flues 36.

The double briquette 30 may be used for cooking as mentioned above. Alternatively the double briquette may be broken along the line defined by the groove 35 into two single briquettes 32 for use as desired.

In Figure 7 there is shown an annular briquette 40 which is formed by extrusion and which has a central bore 42. The briquette 40 is used in what is effectively a unit with six other briquettes 44 as shown in Figure 8 (which may or may not be of the compositions set forth below). Because of the shape of the briquettes 40 and 44, a number of flues 46 and 48 are formed in the unit respectively by the bores 42 and the spaces between the briquettes. The briquette 40 serves as an igniter for the unit.

In Figure 9 there is shown a solid "X"-shaped briquette 50. The briquette 50 is used in what is effectively a unit with six other briquettes 52 (which may or may not be of the compositions set forth below) and the briquettes are arranged as shown in Figure 10. Because of the shape of the briquettes 50, a number of flues 52 are formed in the unit between the arms of abutting briquettes. The briquette 50 serves as an igniter for the unit.

20 **Example 1.**

A rectangular shaped briquette was prepared by mixing raw materials with 30% of water and formed under pressure in a special mould to get the proper shape and size. After demoulding the briquette was dried at 120°C for 8 hours. The briquette is 50 mm high, 100 mm wide and 100 mm long. There are seventeen vertical holes

consisting of flues running from the bottom face to the top face. Sixteen of the flues are equispaced and are of 13 mm diameter. The seventeenth flue is centrally located and is 10 mm in diameter. The ratio of the area of the flues to the solids is 1:3,54. This briquette is of generally of the appearance of the briquette shown in Figure 1 although with less flues therein.

The mass of the dry briquette is 400 grams. The top layer which makes up 20% of the briquette mass contains:-

Charcoal dust	-	37%
anthracite dust	-	40%
✓ sodium nitrate	-	23%

The bottom layer which makes up 80% of the briquette mass contains:-

Coal dust	-	65%
sawdust	-	20%
charcoal dust	-	10%
sodium silicate	-	5%
(dry)		

The initial time from ignition of the briquette to be ready to use was 20 minutes. The briquette burned for 2,5 hours. A metal pot containing two litres of

water was boiling in 20 minutes after the said initial time.

Example 2.

A rectangular shape briquette generally as
 5 illustrated in Figure 1 was prepared by mixing raw
 materials with 30% of water and formed under pressure
 in a special mould to provide the proper shape and
 size. After removal from the mould, the briquette was
 dried at 120°C for 8 hours. The briquette is 47 mm
 10 high, 90 mm wide and 90 mm long. There are sixteen
~~vertical holes or flues cut in the structure running~~
 throughout the height of the briquette. Each hole has
 a diameter of 12 mm. The ratio of the area of the flues
 to the solids is 1:3,48. The mass of the dry briquette
 15 is 280 grams.

The top layer which makes up 20% of the briquette
 mass contains:-

Charcoal dust	-	30%
coke dust	-	32%
starch	-	3%
✓ calcium nitrate	-	35%

The bottom layer which makes up 80% of the
 briquette mass contains:-

Anthracit dust	-	70%
sawdust	-	24%
starch	-	2%
✓ potassium nitrate	-	4%

The initial time from ignition to be ready to use was five minutes. The briquette burned for one hour. A metal pot with two litres of water was boiling in 20 minutes after the said initial time.

5

Example 3.

A cylindrically shaped briquette was prepared by mixing raw materials with 40 percent of water and formed under pressure in special mould to get the proper shape and size. After demoulding, the briquette was
 10 dried at 140°C for 8 hours. The briquette is 4,6 cms high and has a diameter of 15 cms. There are thirty seven vertical holes or flues, each 1,2 cm diameter, cut in the structure. The ratio of the area of the flue to the solids is 1:3,22. The mass of the dry
 15 briquette is 600 grams.

The top layer which makes up 20% of the briquette mass contains :-

Charcoal dust	-	30%
coke dust	-	32%
starch	-	3%
calcium nitrate	-	35%

The bottom layer which makes up 80% of the briquette mass contains :-

Charcoal dust	-	60%
cokedust	-	32%
starch	-	4%
potassium nitrate	-	4%

The initial time from ignition to a red glow was 20 minutes. The briquette burned for two hours and thirty minutes. It was more than enough to prepare a barbecue meal for eight persons.

Example 4.

A rectangular shaped "double-briquette" as illustrated in Figure 5 was prepared by mixing raw materials with thirty percent of water and formed under pressure in a special mould. This mould has a wedge for forming the groove between the two briquettes so that there is a breakable "link" at the bottom of the double briquette. Therefore the two briquettes can be broken free and used separately or together. After demoulding the briquette was dried at 120°C for 8

hours. The briquette is 50 mm high, 90 mm wide and 190 mm long. There are seventeen vertical holes or flues in each half of the briquette. Sixteen of them are 12 mm diameter and one is of 10 mm and is located in the middle cut in the structure. The ratio of the area of the flues to the solids is 1:3,53. The mass of the dry briquette is 600 grams.

The top layer which makes up 20% of the briquette mass contains :-

Charcoal dust	-	37%
coal dust	-	40%
sodium nitrate	-	23%

10 The bottom layer which makes up 80% of the briquette mass contains :-

Anthracite dust	-	60%
sawdust	-	5%
charcoal dust	-	27%
calcium ligno-sulphanate (dry)	-	8%

The initial time from ignition to be ready to use was fifteen minutes. The briquette burned for one and a half hours. A stainless steel pot with two litres

of water was boiling in seventeen minutes from the end of the initial time.

Example 5.

On a special extrusion type machine the set of six
5 annular briquettes was produced. These briquettes had an external diameter of 36 mm, an internal diameter of 12 mm and a height of 45 mm. The composition of the wet forming mass was constant throughout and comprised:-

Anthracite dust	-	27,78%
sawdust	-	7,94%
charcoal dust	-	15,87%
coal dust	-	19,84%
sodium silicate (wet-water glass)	-	7,94%
clay (dry)	-	4,76%
water	-	15,87%

10 The briquettes were dried at 120°C. After drying, the briquettes were used as follows:- The briquettes were arranged in a pattern as shown in Figure 8. The igniting briquette made in accordance with Example 6 was inside and six other briquettes were
15 located on its sides. Then the middle or igniting briquette was lit and after ten minutes the briquettes

were so hot that a pot with water could be placed thereover for heating. It took twenty minutes to boil one and a half litres of water.

Example 6

5 The same machine was used later to make briquettes of the same shape and size briquette but the composition of the wet mass was:

Sodium nitrate	-	14,93%
charcoal dust	-	29,10%
Anthracite dust	-	27,61%
nitric acid	-	4,48%
water	-	23,88%

This briquette constituted the igniting briquette mentioned in Example 5.

10

GENERAL

We have found that the briquettes above described are more satisfactory than coal. Coal has a number of disadvantages viz:-

- 15 a) coal is difficult to ignite and needs additional work and material to start burning, b) coal needs time to burn freely e.g. to be ready for cooking, c) during this time some of the initial potential energy is lost, d) coal produces smoke and soot during the initial rise to the red glow temperature, e) coal can stain pots,

f) coal usually needs relatively expensive equipment such as stoves and chimneys in order to operate, g) there is no close contact with the heated medium during the cooking process so that a lot of heat is lost, h) it is difficult to evaluate the optimal quantity of coal to be used for any particular purpose and usually much more coal than is necessary is burnt for cooking, and i) coal is difficult to handle in small quantities.

10 The above embodiments of the invention deal with all of above mentioned disadvantages of coal. The embodiments of the invention avoid some of these disadvantages partly and some completely. The briquettes make cooking simpler, quicker and economical.

15 The briquettes of the invention may be used in the domestic market in *inter alia* the following ways: (i) as a source of heat to make a barbecue or braai, (ii) as a cooking fuel for poorer classes of the society and (iii) as an igniter for other kinds of
20 solid fuels.

We have found that the igniting section burns very quickly and therefore produces smoke only for short time. Therefore a geometrical structure of such a briquette should be constructed in such a way that:

- a) there is enough of the oxidizer (igniting) part to start combustion with atmospheric air only,
- b) the structure should provide maximum air access necessary for further combustion, and
- 5 c) internal heat transfer must be optimal.

Such a structure is very good from the economical point of view and also gives almost smokeless combustion. Because less fuel is used, less pollution is created. Such a briquette can be used as an igniter
10 for other briquettes like for example the popular egg shape briquettes or even coal or charcoal.

It is possible to employ brick making machinery to make such briquettes. Only the mould must be modified to get appropriate shape of the briquette. When a wet
15 process is used, after forming, briquettes will be dried in temperatures not higher than 280°C.

The invention is not limited to the precise constructional details hereinbefore described and illustrated in the drawings. For example, the flues may
20 increase or decrease in cross-section over their lengths. They need not necessarily be vertical when the briquettes are in the positions as illustrated. The briquettes may be of different shapes to those described above. For example the briquettes may be of
25 conventional egg shape or trapezoidal in section or may

be in the shape of hexagonal rods. The ratio of the area of the flues to the solids may vary as described above.

WE CLAIM:

1. A briquette incorporating an oxidising material.
2. A briquette as claimed in claim 1 wherein the carbonaceous material has been treated with an oxidising acid so as to have an igniting layer with an oxidising material content so that once the oxidising layer has burnt, the rest of the carbonaceous material will have been ignited and will continue to burn giving off usable heat.
3. A briquette as claimed in claim 2 wherein the said acid is nitric acid.
4. A briquette as claimed in claim 1 comprising two sections, that are attached to one another, one of the sections (hereinafter called "the igniting section") being high in oxidising material.
5. A briquette as claimed in claim 4 wherein the other section (hereinafter called "the combustible section") also has an oxidising material but of lower content.
6. A briquette as claimed in claim 4 wherein the combustible section has no oxidising material content.

BAD ORIGINAL

7. A briquette as claimed in claim 4 wherein the igniter section is of smaller volume than the other section.

8. A briquette as claimed in claim 4 which is of constant cross-section throughout its height.

9. A briquette as claimed in claim 4 wherein the igniting section comprises an end layer of the briquette.

10. A briquette as claimed in claim 4 wherein the igniting layer is located between the ends of the other layer.

11. A briquette as claimed in claim 7 wherein the igniting layer comprises between fifteen and thirty per cent by mass of the briquette.

12. A briquette as claimed in claim 11 wherein the igniting layer comprises twenty per cent by mass of the briquette.

13. A briquette as claimed in claim 1 provided with one or more internal flues running through it from the one end to the other.

BAD ORIGINAL

14. A briquette as claimed in claim 13 wherein the ratio of the volume of the flues to the solid material constitutes between 1:1 to 1:13.

15. A briquette as claimed in claim 14 wherein the ratio of the volume of the flues to the solid material constitutes between about 1:2 to 1:10.

16. A briquette as claimed in claim 13 wherein the flue or flues are circular in section.

17. A briquette as claimed in claim 13 comprising between sixteen and seventeen flues.

18. A briquette as claimed in claim 13 comprising a single flue wherein the briquette is annular in section.

19. A briquette as claimed in claim 8 wherein the briquette is solid and shaped so that when a number of briquettes are placed close together they form a combustible unit comprising solid material with flues therebetween.

20. A briquette as claimed in claim 19 wherein the briquettes are of circular section.

BAD ORIGINAL

21. A briquette as claimed in claim 19 wherein the briquettes are "X"-shaped in section and when placed close together there will be flues between them.

22. A briquette as claimed in claim 1 wherein the oxidising material comprises one or more of the following, viz:- inorganic nitrates, nitrites, chlorates, perchlorates, permanganates, manganates, perbromates, chromates, dichromates, peroxides and an organic oxidizer.

23. A briquette as claimed in claim 22 wherein the organic oxidizer is nitrocellulose.

24. A briquette as claimed claim 22 wherein the oxidizer was created by the action of chemicals on solid fuel composition.

25. A briquette as claimed in claim 22 wherein the oxidizer was created by the reaction of nitric acid with alkaline.

26. A briquette as claimed in claim 1 wherein the oxidising material was formed by the addition of an alkaline agent to the mixture of ingredients from which the briquette is formed.

27. A briquette as claimed in claim 25 wherein the alkaline agent is caustic soda or soda ash.

BAD ORIGINAL

28. A briquette as claimed in any one of the preceding claims wherein the briquettes have a mass of from 50 gm to two kilograms.

29. The combination of a briquette as claimed in claim 1 (hereinafter called "the igniter briquette") with a number of similarly shaped briquettes to serve as an igniter therefor.

30. The combination as claimed in claim 29 wherein the igniter briquette is as claimed in claim 21.

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Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Application number
GB 9521693.3

Relevant Technical Fields

- (i) UK Cl (Ed.O) CSG (GEX, GFA)
(ii) Int Cl (Ed.6) C10L 5/02, 5/36, 5/38, 9/10, 9/12

Search Examiner
M R WENDT

Date of completion of Search
10 JANUARY 1996

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Documents considered relevant following a search in respect of Claims :-
1-30

(ii) ONLINE: WPI, CLAIMS, JAPIO

Categories of documents

- | | |
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| <p>X: Document indicating lack of novelty or of inventive step.</p> <p>Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.</p> <p>A: Document indicating technological background and/or state of the art.</p> | <p>P: Document published on or after the declared priority date but before the filing date of the present application.</p> <p>E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.</p> <p>&: Member of the same patent family; corresponding document.</p> |
|--|---|

Category	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2267289 A (BURN EAZY) see Claims 1-5	1, 22
X	GB 1090704 (MOBIL) see Claims 1 and 2. Page 5 lines 16 etc	1, 22
X	GB 395282 (MENNIE) see Claim 1. Page 1 lines 20-22. Page 2 lines 4 etc	1, 22
X	US 4981496 (OPALITE) see Claim 1. Column 3 lines 44-55	1, 22
X	WPI Accession No 77-08704Y/05 and JP 770000961B (SHINAGAWA) see Abstract	1, 22
X	WPI Accession No 74-60725V/34 and JP 740028244B (OKISHIGE) see Abstract	1, 4, 22
X	WPI Accession No 78-55783A/31 and JP 790044282B (MITSUUROKO) see Abstract	1, 4, 22
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Continuation page

Category	Identity of document and relevant passages	Relevant to claim(s)
X	WPI Accession No 93-279982/35 and SU 1759857 A1 (PLEKHANOV) see Abstract	1, 4, 22
X	WPI Accession No 88-346332/49 and CN 860103948 A (LIU) see Abstract	1, 22
X	WPI Accession No 83-836075/49 and JP 580185689 A (KYOWA) see Abstract	1, 4, 22
X	WPI Accession No 91-228362/31 and KR 900004941B (KIM) see Abstract	1, 4, 22